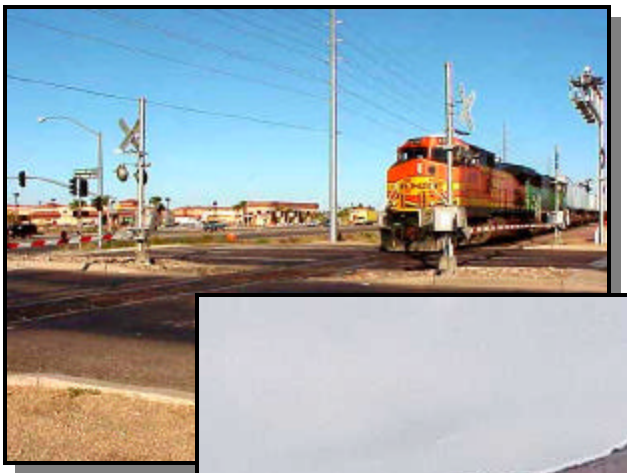
Maricopa County Department of Transportation

2003 State of the System Report



Transportation Planning Division
Program & Systems Analysis

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CONGESTION MANAGEMENT SYSTEM - EXECUTIVE SUMMARY

Traffic Congestion on County Roads

The MCDOT Congestion Management System (CMS) evaluates and identifies traffic congestion on County roads, outlines the laws and policies affecting the CMS, establishes the roles of the County's Comprehensive Plan and Transportation System Plan in the CMS, states CMS objectives and identifies potential projects. MCDOT will review, revise and update the CMS annually and recommend congested roadway segments for further study and future improvements.

Traffic Congestion on the Maricopa County road network is quite low and is expected to remain low through the year 2020 assuming capital investments are adequate to maintain and improve the system to desired levels. Currently as much as 1.4% of arterial and collector County roads may be congested and approximately 4.8% additional arterial and collector roads may become congested by the year 2010 based on MCDOT Roadway Design Manual (RDM) criteria (Tables 1 and 2). Approximately one-third of these roads are currently being studied for improvement. The level of congestion on arterial and collector County roads based on Level of Service (LOS) F is about 0.05% with approximately 2.2% exceeding Level of Service (LOS) F by 2010. The CMS identified 154 roadway segments that may be or become congested by the year 2010 based on RDM criteria and 53 based on absolute capacities. Eleven of those segments are currently being studied for improvement. County islands adjacent to developed areas are among the most congested County roadways.

Table 1: Summary of Potentially Congested Center Line Miles of County Roads That Are Not Under Study. Based on the Roadway Design Manual Criteria and Absolute Capacities (miles).

Functional Class	Miles Congested in 2003 Based on…		Miles Expected to be Congested by 2010 Based on…		Total Miles Congested based on…		Total Miles in County Network
	RDM	Absolute Capacity	RDM	Absolute Capacity	RDM	Absolute Capacity	
Arterial	2.63	0.00	9.90	1.00	**12.53**	**1.00**	182.26
Collector	8.21	0.65	35.35	5.29	**43.56**	**5.94**	1,245.56
TOTAL	10.84	0.65	45.25	6.29	**56.09**	**6.94**	1,427.82

Table 2: Summary of Potentially Congested Center Line Miles of County Roads That Are Under Study. Based on MCDOT Roadway Design Manual Criteria and Absolute Capacities (miles).

Functional Class	Miles Congested in 2003 Based on…		Miles Expected to be Congested by 2010 Based on…		Total Miles Congested based on…		Total Miles in County Network
	RDM	Absolute Capacity	RDM	Absolute Capacity	RDM	Absolute Capacity	
Arterial	1.00	0.00	3.11	2.73	**4.11**	**2.73**	182.26
Collector	7.45	0.00	21.38	5.12	**28.83**	**5.12**	1,245.56
TOTAL	8.45	0.00	24.49	7.85	**32.94**	**7.85**	1,427.82

An analysis of traffic congestion at intersections was performed, in addition to roadway segment congestion analysis. Intersection capacities were calculated using modified Highway Capacity Manual (HCM) methods and revised to accommodate larger scale analysis. These capacities should be considered much more accurate than RDM or absolute capacity methods since they account for the traffic control devices and intersection structure.

The results of the intersection analysis show that there are 21 intersections not currently being studied that have at least one congested leg (V/C greater than 1.00) and 34 additional unstudied intersections that may experience congestion problems by the year 2010. There are also 10 intersections that are currently being studied that have at least one congested leg and 12 additional intersections that are under study that may experience congestion problems by the year 2010.

Roads Selected for Priority Consideration

The results of the analysis provide seven primary and seven secondary prioritized roads to be considered for congestion improvements (Tables 3 & 4). These roads were selected because they may be experiencing significant traffic congestion or are most likely to do so in the near future.

Table 3: Primary Roads Selected for Priority Consideration Based on Absolute Capacities (Sorted by "Current Absolute V/C")

Road	Current ADT	2003 LOS	2010 LOS	2020 LOS	Current Absolute V/C	2010 Absolute V/C	2020 Absolute V/C	Lanes	Miles
Bell Rd (Burns Dr to Peoria C/L)	50,788	C	B	A	0.75	0.61	0.55	6	0.18
Mc Dowell Rd (Alma School Rd to Extension Rd)	16,055	A	E	E	0.46	0.92	0.94	4	0.5
Mc Dowell Rd (Extension Rd to Arizona Ave)	13,536	A	E	E	0.39	0.93	0.93	4	0.27
Queen Creek Rd (Chandler C/L to Gilbert Rd)	6,103	A	D	F	0.39	0.83	1.14	2	0.13
051st Ave (South St Johns to Continuous)	5,891	A	C	B	0.37	0.76	0.64	2	0.75
051st Ave (Continuous to Ray Rd)	5,891	A	C	B	0.37	0.76	0.64	2	1
051st Ave (Ray Rd to Grir Boundry)	5,891	A	C	B	0.37	0.76	0.64	2	0.25

Congestion Evaluation

Volume to capacity ratios (v/c) are used to indicate congestion because they can be projected to future years, are easily understood, can be applied to individual road segments, work well on rural, urban and non-freeway roads, and volume and capacity data are readily available. From the v/c ratio, the v/c index was developed to eliminate the need to compare v/c ratios with the desired LOS for each segment based on its functional class. In addition, the v/c index is more easily interpreted than a v/c ratio since segments with values less than 1.00 are not considered congested at the desired LOS and those over 1.00 may be congested based on MCDOT Roadway Design Manual criteria.

Table 4: Primary Roads Selected for Priority Consideration Based on Absolute Capacities
(Sorted by "Current Absolute V/C")

Road	Current ADT	2003 LOS	2010 LOS	2020 LOS	Current Absolute V/C	2010 Absolute V/C	2020 Absolute V/C	Lanes	Miles
051st Ave (Lower Buckeye Rd to Phoenix C/L)	18,051	F	E	F	1.15	0.92	1.46	2	0.5
Thunderbird Blvd (Del Webb Blvd to Camelot Cir)	17,556	F	F	F	1.11	1.31	1.66	2	0.15
Guadalupe Rd (Gilbert C/L to 172nd St)	13,523	D	D	F	0.86	0.88	1.13	2	0.44
Union Hills Dr (107th Ave to Welk Dr)	12,788	D	E	F	0.81	0.92	1.11	2	0.15
Broadway Rd (Phoenix C/L to 027th Ave)	12,158	C	F	F	0.77	1.28	1.81	2	0.99
Union Hills Dr (Welk Dr to 104th Ave)	12,177	C	E	F	0.77	0.92	1.11	2	0.22
McKellips Rd (Hayden Rd to Sr101)	22,122	B	F	F	0.63	1.08	1.05	4	1

Twenty-one intersections were selected for priority consideration for further study (Table 5). Potential improvements may include traffic signal installation, traffic signal

Table 5: Intersections Selected for Priority Consideration

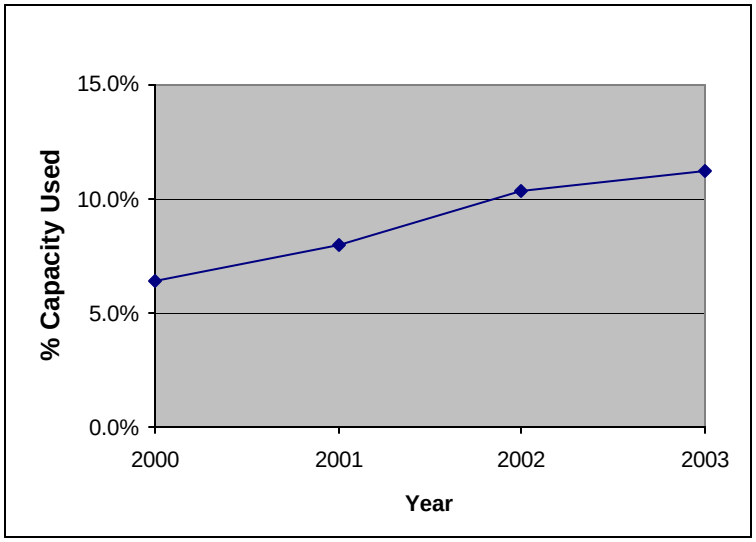
Intersection	Average V/C	V/C Range (lowest leg – highest leg)	Control Devices	Potential Improvement
098TH AVE / BELL RD	1.88	1.65–2.11	Signal	Further study. Only 2 legs analyzed. Possibly retime signal.
099TH AVE / BELL RD	1.64	0.87–2.68	Signal	Possibly retime signal short-term. Add lanes long-term.
114TH AVE / BELL RD	1.42	1.42	Signal	Further study. Not enough legs to make decision.
BELL RD / BOSWELL BLVD	1.36	0.70-2.68	Signal	Possibly retime signal short-term. Add lanes long-term.
BELL RD / BURNS DR	1.32	0.55-1.76	Signal	Possibly retime signal.
BELL RD / DEL WEBB BLVD	1.21	0.83-1.56	Signal	Possibly retime signal short-term. Add lanes long-term.
GRANITE VALLEY DR / MEEKER BLVD	1.12	1.07-1.19	Stop/Stop	Investigate signal installation.
107TH AVE / DEL WEBB BLVD	1.1	0.66-1.44	Stop/Stop	Investigate signal installation.
107TH AVE / UNION HILLS DR	1.09	0.83-1.35	Stop/Stop	Only 2 legs analyzed. Investigate signal installation.
ALEPPO DR / MEEKER BLVD	1.09	1.09-1.09	Stop/Stop	Only 2 legs analyzed. Investigate signal installation.
051ST AVE / LOWER BUCKEYE RD	1.05	0.23-1.88	Signal	Possibly retime signal.
CAMINO DEL SOL / MEEKER BLVD	0.94	0.63-1.09	Stop/Stop	Investigate signal installation.
091ST AVE / NORTHERN AVE	0.88	0.70-1.14	Signal	Possibly retime signal.
099TH AVE / THUNDERBIRD BLVD	0.87	0.40-1.15	Signal	Possibly retime signal.
107TH AVE / OLIVE AVE	0.85	0.57-1.15	Signal	Possibly retime signal.
BROADWAY RD / ELLSWORTH RD	0.82	0.41-1.60	Signal	Possibly retime signal.
RECKER RD / UNIVERSITY DR	0.8	0.58-1.06	Signal	Possibly retime signal.
CAMINO DEL SOL / SPANISH GARDEN DR	0.76	0.28-1.25	Stop/Stop	Investigate signal installation.
103RD AVE / THUNDERBIRD BLVD	0.66	0.38-0.98	Signal	Possibly retime signal.
ELLSWORTH RD / SOUTHERN AVE	0.59	0.07-1.09	Signal	Possibly retime signal.
EL MIRAGE RD / OLIVE AVE	0.44	0.17-1.16	Stop/Stop	Investigate signal installation.

retiming, changing traffic control devices, and/or adding lanes.

Current traffic volume data were gathered from year 2000 traffic counts provided by MCDOT's Traffic Division and from MCDOT's Roadway Management System (RMS) database. Projected traffic volumes for the years 2010 and 2020 were generated using the Maricopa Association of Government's (MAG) EMME/2 traffic model. The model predicts traffic volumes for primary and secondary roads only.

Findings show the MCDOT roadway system has experienced a decline in capacity and an increase in traffic volumes (Figure 1). The capacity of County roads (weighted by their segment length) was 9,575 in FY 2000, 9,261 in FY 2002 and 9,459 in FY 2003. Their average traffic volumes (weighted by segment length) were 615 vehicles per lane-mile in FY 2000, 956 vehicles per lane-mile in FY 2002 and 1,063 vehicles per lane-mile in FY 2003. The volume/capacity ratio has increased significantly over the last two years.

Figure 1: Trend in Capacity Used on County Roads



Laws and Policies Affecting the CMS

Several state and federal regulations guide the operation, structure and content of the CMS. They include state and federal air quality laws and federal congestion management regulations.

The Transportation Equity Act for the 21st Century (TEA-21) compels Municipal Planning Organizations to develop an approved congestion management system and recommend seven planning strategies. The strategies are to:

1. "support the economic vitality of the metropolitan area, especially by enabling global competitiveness, productivity and efficiency."

2. “increase the safety and security of the transportation system for motorized and nonmotorized users.”

3. “increase the accessibility and mobility options available to people and for freight.”

4. “protect and enhance the environment, promote energy conservation, and improve quality of life.”

5. “enhance the integration and connectivity of the transportation system, across and between modes, for people and freight.”

6. “promote efficient system management and operation.”

7. “emphasize the preservation of the existing transportation system.”

The Federal Highway Administration (FWHA) oversees and recommends the general design of roadways and regulates the flow of federal monies to transportation projects. The FHWA also enforces the regulations set by the Transportation Efficiency Act for the 21st Century (TEA-21) by controlling federal funding. These requirements not only affect the design of roadways, but also suggest management practices and help enforce air quality laws.

The Maricopa Association of Governments (MAG) organizes, develops, recommends and implements plans and policies regarding the allocation of federal funds for the entire transportation system within Maricopa County. MAG assesses the Arizona Department of Transportation (ADOT), MCDOT and local jurisdiction’s roadway systems in Maricopa County and examines their implementation of alternative modes of transportation. Federal monies are funneled through MAG who ensures that federal requirements are met before any distributions are made.

County Plans, Programs and Objectives

The primary purpose of the CMS in the Transportation Improvement Program (TIP) process is to identify individual road segments where traffic congestion may currently be or may be a problem in the future. It also provides recommendations for roadway improvements in the TIP. The CMS should meet the following criteria prior to recommending any project:

1. It should be applied consistently
2. It should evaluate all significant factors
3. It should apply fair cost-sharing practices
4. It should be consistent with all laws and County policies
5. It should recommend cost-effective solutions
6. It should provide for self-evaluation

The County's Comprehensive Plan and the Transportation System Plan also guide the CMS. The Comprehensive Plan states the County's policy to maximize and effectively use the existing and future transportation system. It establishes an overall management perspective for the County and sets the County's broader transportation related goals and objectives. Those goals are to:

1. Reduce single occupant vehicle (SOV) traffic
2. Improve transit
3. Improve transportation facilities
4. Optimize public investment
5. Minimize travel times

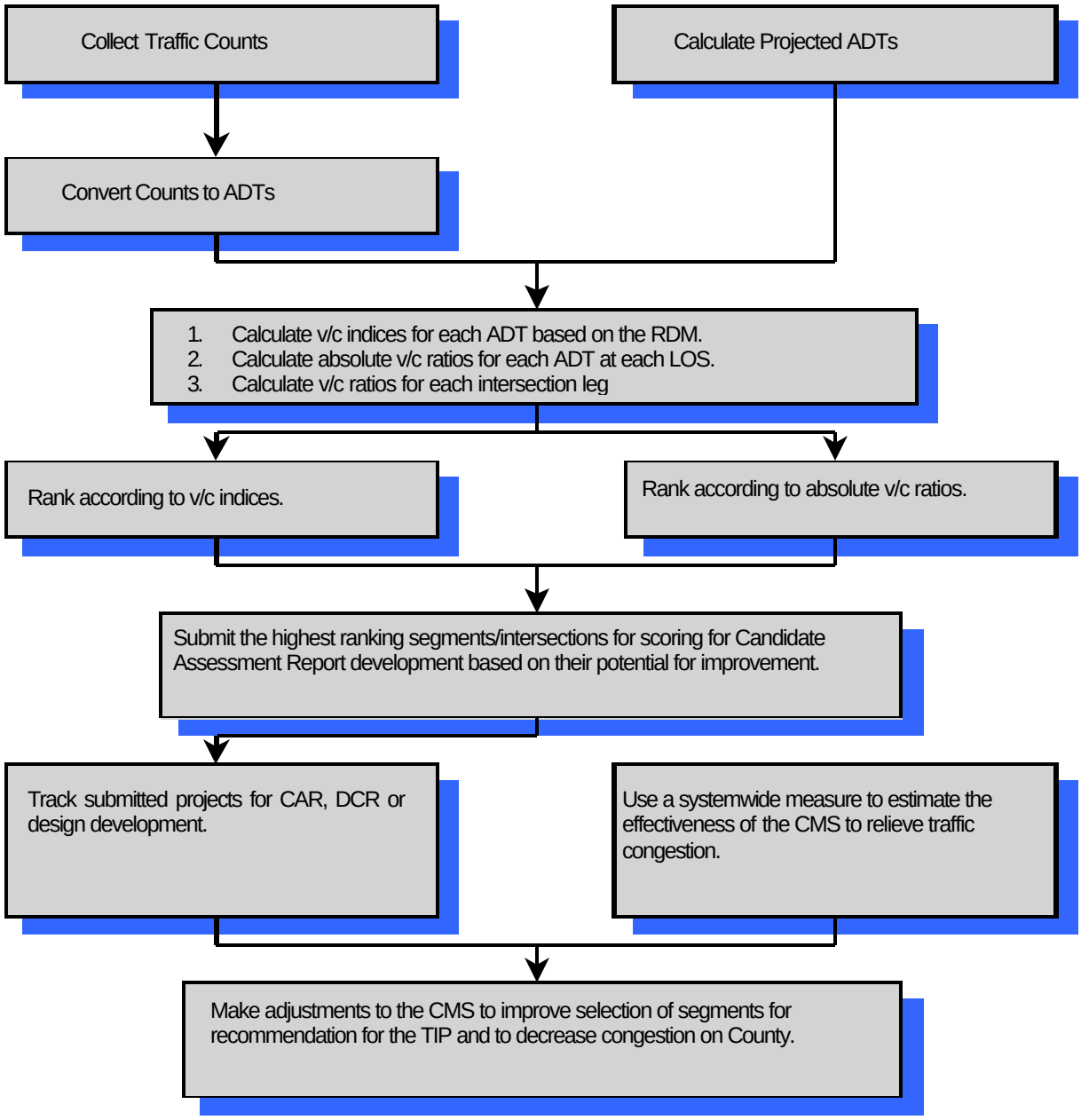
The Transportation System Plan, however, focuses on more specific transportation goals. It directs the CMS to identify congestion on the County network and to provide for cost-effective solutions in reducing congestion. Its goals for the CMS are to:

1. Ease congestion
2. Provide for traffic modeling
3. Provide decision-making strategies
4. Identify alternatives
5. Evaluate the CMS actions and results

CMS Procedures

The annual CMS analysis process requires several steps to identify congested County roads (Figure 2). V/C indices and absolute v/c ratios are calculated and the resulting values are ranked in descending order. The road segments with the highest v/c index values are then recommended for Candidate Assessment Report (CAR) development and tracked to see whether they proceed to Design Concept Report (DCR) development and possible construction. Based on the success of selected projects for DCR development and construction, in addition to system wide congestion analysis, adjustments to the CMS are made and included in the next annual CMS cycle.

Figure 2: CMS Process at MCDOT



SAFETY MANAGEMENT SYSTEM - EXECUTIVE SUMMARY

PURPOSE OF THE SMS

The County Safety Management System (SMS) is s systematic process that has the goal of reducing the number and severity of traffic accidents through improving the physical conditions of roadway segments and specific intersections. The SMS is primarily a tool for identifying, analyzing, implementing, and evaluating traffic safety on MCDOT's roadways. The SMS is also intended to provide guidance to MCDOT staff, the Transportation Advisory Board, and the Board of Supervisors in selecting, recommending, and implementing effective roadway safety strategies and projects.

SAFETY IMPROVEMENT PROJECT ACCOMPLISHMENTS FOR FY 2002

- 31 projects were completed.
- 23 safety projects were started in 2002, and were still underway as of June 30, 2002.
- $1,408,234 was spent by both the Traffic Engineering And Operations Branches on safety projects.
- Thirteen additional projects were identified for safety improvements in FY 2003.

ROLE OF THE SMS IN TRANSPORTATION IMPROVEMENTS PROGRAMMING

Safety improvement projects, primarily intersection-related, are identified through the SMS and ranked by the MCDOT Traffic Engineering branch of the Engineering Division. Traffic Engineering then makes project recommendations for inclusion in the TIP to the MCDOT Planning Division. A list of ranked projects is subsequently submitted to the TIP Review Committee and the Project Review Committee (PRC). The programming process continues as PRC project recommendations are forwarded to the Transportation Advisory Board (TAB) who in turn recommends a final list of projects to the county Board of Supervisors for funding.

The MCDOT Traffic Engineering branch along with the Construction and Operations Division has a goal to spend approximately $500,000 per year on safety improvement projects. The process has already been in place for approximately four years with the use of databases from accidents and public complaints.

Each year, a priority list of intersections for improvements is developed through the Continuous Reduction of Accidents for Safer Highways (CRASH) program and analyzed for safety and/or capacity improvements and presented to MCDOT Transportation Planning Division.

For fiscal year 2002, ending June 30, 2002, the Traffic Engineering branch has compiled a list of safety improvement projects with some carryovers from FY 2001. Some projects were generated from customer complaints, and so from new federal

safety standard relating to guardrails. When the cost of constructing these safety improvements is below $50,000, in-house resources are used. If the cost is above $50,000 the projects may be recommended for consideration in the County's TIP.

MCDOT SAFETY IMPROVEMENTS FOR 2002

MCDOT Traffic Engineering and Traffic Operations completed 31 projects in FY 2002 totaling $1,408,234.00, these included 19 programmed and 12 un-programmed projects. Twenty-three projects were started in FY 2002 and are currently underway. An additional 13 are new projects scheduled to begin in FY 2003.

Table 6: Safety Projects Completed in FY 2002

Location	Project	Cost
Aguila Road / Wickenburg & Vulture Mine Road	Geometric Improvements	$5,988
Alsup Avenue: Camelback Road - Maryland Avenue	Guardrail	$20,219
Bell Road & 99th Avenue	Geometric Improvements	$5,726
Bell Road & Boswell Blvd.	Signal Update	$5,495
Brown Road & Ellsworth Road	Traffic Signals	$117,694
Bush Highway & Waterusers Rec. Area	Geometric Improvements	$11,880
Camelback Road & Sarival Avenue	4-Way Stop	$4,200
Chandler Hgts. Road & Hawes Road	4-Way Stop	$4,200
Crismon Road & Adobe Road	4-Way Stop	$4,200
Dobbins Road @ Laveen School	Geometric Improvements	$3,308
Dove Valley Road: 64th Street - 68th Street	Geometric Improvements	$923
Dynamite Boulevard & 52nd Street	Geometric Improvements	$19,222
Elliot Road & Ellsworth Road	New Signal	$106,227
Germann Road & Higley Road	4-Way Stop	$4,200
Guadalupe Road & Power Road	Signal Update	$17,310
Higley Road: Hunt Highway - Stacey Road	Guardrail	$75,138
Joy Ranch Road & 7th Street	4-Way Stop	$4,200
Kachina Road & Deer Trail Road	4-Way Stop	$4,200
Loop 303 & Indian School Road	Geometric Improvements	$608,108
Meeker Blvd.: Grand Avenue to R.H. Johnson Blvd.	Geometric Improvements	$68,896
Northern Avenue & 107th Avenue	Geometric Improvements	$3,455
Olive Avenue & 111th Avenue	New Signal	$115,150
Olive Avenue & El Mirage Road	New Signal	$96,601
Peoria Avenue & 99th Avenue	Geometric Improvements	$4,009
Power Road n/o Williams Field Road	Geometric Improvements	$23,350
Queen Creek Road & Power Road	4-Way Stop	$4,200
R.H. Johnson Blvd. & 151st Avenue	New Signal	$37,692
Riggs Road & Alma School Road	Signal Update	$18,540
Riggs Road & Sossaman Road	4-Way Stop	$4,200
Van Buren Street & Sarival Avenue	4-Way Stop	$4,200
Via De Palmas: McQueen Road - 122nd Street	Geometric Improvements	$5,503
	Total	**$1,408,234**

Table 7: Safety Projects Scheduled to Start in FY 2002 and FY 2003.

Projects Scheduled to Start in FY 2002	
Location	Project
27th Ave.: Estrella Ave. - Photo View Rd.	Roadway
90th Street: McDowell Road to Quenton Street	Roadway
Acoma Drive: 79th Avenue - 75th Avenue	Traffic Calming
Alma School Road & Champagne	New Signal
Bell Road & 98th Avenue	Signal Update
Broadway Road & Ellsworth Road	Signal Update
Bush Highway: 7 Locations	Guardrail
Carefee Highway & 56th Street	New Signal
Crismon Road .5 mile north of Brown Road	Guardrail
Ellsworth Road & Coralbell Avenue	New Signal
Happy Valley Road & 67th Avenue	New Signal
Loop 303 & Northern Avenue	Roadway
Loop 303 & Olive Avenue	Roadway
M.C. 85 & 83rd Avenue	Signal Update
McDowell Mtn. Park Pay Station	Roadway
McDowell Mtn. Rd. & McDowell Mtn. Park Dr.	Roadway
Old U.S. 80 .5 miles n/o Desert Rose Road	Guardrail
Olive Avenue & 103rd Avenue	Signal Update
Southern Avenue & Ellsworth Road	Signal Update
Thomas Road: Cotton Lane to Loop 303	Roadway
Union Hills Drive & 107th Avenue	New Signal
Williams Field Road & Lindsay Road	New Signal
Williams Field Road & Val Vista Drive	New Signal
Projects Scheduled to Start in FY 2003	
Anthem Way & Gavilan Peak Parkway	New Signal
Bartlett Dam Road to Horseshoe Dam Road	Guardrail
Beardsley Road & 99th Ave / Lake Pleasant Road	New Signal
Broadway Road & Litchfield Road	Roadway
Cloud Road: 29th Avenue - 27th Avenue	Guardrail
Dixileta Drive & 56th Street	Roadway
Fort McDowell Road & Mohave Road	Guardrail
New River Road: 33rd Avenue to Mano Drive	Guardrail
Queen Creek Road & Power Road	New Signal
Rittenhouse Road & Power Road	Roadway
Seven Springs Road: MP 1.75 0 4.4	Guardrail
Union Hills Drive: 107th Avenue to 99th Avenue	Roadway
Waddell Road & Dysart Road	New Signal

PLANNED SAFETY IMPROVEMENT PROJECTS FOR FISCAL YEAR 2003

Looking ahead to fiscal year 2003, the Traffic Engineering branch has identified 36 safety improvement projects to be completed with in-house resources. The Traffic Engineering and the Operations branches have a combined goal to spend $500,000.00 for safety improvement projects per year. Both branches will attempt to complete the 23 projects that were started in FY 2002 and the thirteen new projects

which are identified in Table 7. The scoring methodology used each year is not a factor in determining the projects displayed in Table 7; hence, the projects are not prioritized.

In addition, guardrail projects were added to comply with a new Federal Highway Administration (FHWA) standard. The standard requires upgrades to existing guardrails especially end treatments and the implementation of new guardrails to enhance roadway safety.

OVERALL COUNTY CRASH RATES

While calculating crash rates for roadway segments and intersections provides a good indicator of potential problem locations, an indicator is also needed that describes the accident history of the entire County roadway system. This factor is needed so that progress towards making the County's roadways safer can be measured over time. The overall County crash rate was selected. This measures the number of crashes per million vehicle miles of travel (VMT), per mile of County owned roadway, per year. See Table 8.

The crash rates and the total number of crashes shown in Table 8 show a significant downward trend over the past four years for County roadways. While the trend is steadily downward, why it is occurring can not be absolutely determined. It is probably the result of several factors including

- Making safety improvements to many high crash rate intersections through the MCDOT's CRASH program.
- Reductions of County roadway mileage through annexations by the cities and towns.
- of traffic off parallel MCDOT roadways thus eliminating many crashes.
- More accurate data collection by the State.

It is also very encouraging that the crash rate in the County has been declining for the past four years despite an increase in the vehicle miles of travel on the remaining County roadways. MCDOT will continue to monitor this trend in future years.

Table 8: County Crash Rates for 1998-2001

Factors	1998 Data	1998 Rate	1999 Data	1999 Rate	2000 Data	2000 Rate	2001 Data	2001 Rate
Miles of County Owned Roads That Have traffic Counts	1,592		1,729		1,719		1,690	
Total County Road Miles	2,822	**1.65***	2,768	**1.58***	2,719	**1.45***	2,680	**1.06**
VMT/Day	2,885,592		3,453,031		3,558,490		3,818,639	
VMT/Mile/Day	1,812		1,997		2,070		2,260	
Crashes	3,085		3,188		2,985		2,341	
% of the Network Counted	55.2%		62.4%		63.4%		63.1%	

*These rates were adjusted from the 2001 SMS report due to more accurate data and calculations.

BRIDGE MANAGEMENT SYSTEM - EXECUTIVE SUMMARY

Maricopa County is currently responsible for maintaining 366 bridges and structures (box culverts) as well as planning for the design and construction of new bridges and structures. MCDOT has standardized its evaluation and prioritization of bridge projects within the County. This process is now the basis for MCDOT's bridge project recommendations for the County's five-year Transportation Improvement Program as well as a long-term planning tool for future funding of bridge construction projects. Beginning in 1999 MCDOT continues to focus on its bridge resources on scour protection projects. This scour protection mitigation will ultimately save possible future long traffic disruptions and costly bridge repair or replacement.

BACKGROUND

Today MCDOT has 259 on-system bridges (bridges and box culverts 20 feet or longer) and 107 off-system structures (box culverts and structures shorter than 20 feet) inspected on a biannual basis. In keeping with Federal requirements, the record of these inspections is forwarded to the ADOT's Bridge Management Group by April of each year. The State Bridge Inventory System (SBIS), which MCDOT and Arizona Department of Transportation (ADOT) use, is a combination of three databases: the inventory database, the inspection database, and a maintenance database. Since it takes two years for MCDOT to inspect its entire bridge inventory total inventory comparisons will be analyzed every even year beginning in 2000.

It is important to understand that the SBIS is only an inventory database and not a management system. In 1993, MCDOT participated as a member of the Bridge Management System ISTEA Technical Committee. This was a statewide team chaired by ADOT to form guidelines and procedures for the implementation of PONTIS, a Bridge Management System. MCDOT continues to gather the necessary inspection data for input into PONTIS. MCDOT will benefit from ADOT's efforts to implement this system, since MCDOT's bridge database is a subset of ADOT's statewide database. ADOT continues to formulate guidelines and procedures for implementation of PONTIS. Once this task is complete and PONTIS fully operational, MCDOT will request ADOT to downloaded information from PONTIS. Full implementation of PONTIS is anticipated by 2005 and will be used for bridges and structures over 20-feet in length.

DATA GATHERING AND ANALYSIS

Definition of Bridge and Bridge Types

In accordance with the American Association of State Highway and Transportation Officials (AASHTO) Transportation Glossary, a "bridge" is defined as "a structure in service including supports erected over a depression or in an obstruction, such as water, highwya, or railway, and having a track or passageway for carrying traffic or other moving loads, and having an opening measured along the cneter of the road-

way of more than 20 feet between under copings of abutments or spring lines or arches, or extreme ends of openings for multiple boxes; it may also include multiple pipes where the clear distance between openings is less than half of the smaller contiguous opening."

Special Reduction to Sufficiency Rating

If the sufficiency rating was used as the only evaluation criteria the following conclusions could be drawn:

A bridge could have a rating of 18-82 based solely on its structural condition, serviceability and functionality without regard to its use or size. It could receive Federal replacement funds or be 3 points from being eligible for rehabilitation funds. (Bridges scoring below 80 are eligible for rehabilitation funds, while bridges scoring below 50 are eligible for replacement funds.)

No consideration is given to the remaining useful life of the structure. No consideration is given to the cost of rehabilitation or the associated benefits. Two or more bridges could have the same sufficiency rating. There would be no way to prioritize without additional factors.

For these reasons, in order to evaluate and prioritize rehabilitation projects, other factors are considered in order for the County to decide how to maximize their expenditure of dollars. The following additional factors are used. Beginning with the 2002 BMS, MCDOT will add Structural Safety to the following list. This will require re-evaluation and modification to the current 100 point scoring system.

- Sufficiency Rating
- Inventory Rating (Structural Safety)
- Functional Obsolescence
- Load Limits
- Traffic Safety on or Near the Bridge
- Hydraulics
- Remaining Useful Life
- Average Daily Traffic
- Public Inconvenience - Emergency Use
- Benefit/Cost Ratio

REPLACEMENT OF EXISTING BRIDGES

Funding availability for bridge rehabilitation projects are often time limited. Therefore it is very important to implement a rehabilitation project that will give the best return of the dollars spent. Replacement of a bridge may cost several times more than the cost to rehabilitate, but a new bridge if properly designed and constructed will last longer than a rehabilitated bridge. Therefore, the cost to rehabilitate should be carefully considered and estimated.

In addition, other items such as the bridge's functionality, sufficiency rating and the bridge engineer's judgment should be considered before replacement of an existing structure. MCDOT recommends replacement of an existing bridge should be considered when all four of the following conditions are met::

- If the cost of rehabilitation is 55% of the cost of a new bridge and,
- The existing bridge is classified as functionally obsolete and,
- The sufficiency rating of the existing bridge is < 50 and,
- The judgment of the Bridge Engineer

NEW BRIDGE ADDITIONS

Since FY 2001 three new bridges have been added to MCDOT's inspection inventory.

Clearview Road on Loop 303 (Estrella Freeway)
Mountain View Road on Loop 303 (Estrella Freeway)
Loop 303 Grade Separation over Grand Avenue

New bridge projects are projects that require the installation of a bridge and approaches where none currently exist and the bridge is not included in a major road project. The most important consideration for this type of project is benefit/cost. Additional consideration should be given if the new bridge fits with the regional transportation system plan, funding sponsorship, and the projected congestion once the facility is in place.

RECOMMENDATIONS FOR TIP PROGRAMMING PROCEDURES

Each year, MCDOT reviews the highest rated bridge projects from the following subcategories as previously described:

TIP Projects
Replacement of Existing Bridges
Replace Dip Sections with New Structures
New Bridge Projects (not included in major road projects)

Operation/Maintenance Projects

Bridge Rehabilitation Projects

In any given year, the budget allocation may not support inclusion of all top rated bridge projects in the TIP Program. When this occurs, decisions are made based on the rating criteria and professional engineering judgment.

RECOMMENDED BRIDGE MANAGEMENT SYSTEM (BMS) MODIFICATIONS

Since MCDOT has decided to let ADOT implement PONTIS, no additional modifica-

tions to the bridge analysis process are anticipated. MCDOT will continue to gather the necessary inspection data but will not proceed as a separate entity in implementation of the PONTIS bridge management system. MCDOT will benefit from ADOT's extensive efforts to implement this system and to provide the critical analysis results regarding MCDOT's bridges. Use of ADOT's PONTIS expertise should satisfy FHWA in the event they require all agencies responsible for bridges to have an operating BMS before federal funds will be allocated for repair, rehabilitation or replacement of bridges.

NEW ADDITION TO MCDOT'S BRIDGE MANAGEMENT SYSTEM

Beginning in 2000, MCDOT began an Asset Management program for its bridge inventory. A replacement value has been established for each structure. This value will have a straight-line depreciation value based on the total life expectancy of the facility. For example, if a bridge has a life expectancy of 75 years, each year the value of the bridge will be reduced by 1/75 of its original construction cost. In 2002, MCDOT's bridge and structure inventory asset valuation is estimated at $166,539,964.

2002 BRIDGE INVENTORY HIGHLIGHTS

Bridge Inventory Modifications

In 2002, MCDOT's bridge inventory consists of 259 bridges and 107 other structures. Three new bridges were added to the inventory and one new structure was added. No bridges were removed from the inventory due to annexations.

Federal Funding Eligibility Comparisons:

In 2001 MCDOT identified 70 bridges and/or structures eligible for federal rehabilitation funds and 1 bridge or structure eligible for federal replacement funds. In 2002, 108 bridges and/or structures are eligible for federal rehabilitation funds and 2 bridges are eligible for federal replacement funds. This rise in the number of bridges and structures eligible for federal rehabilitation funds is due to the fact that the sufficiency ratings for 81 structures along the Sun Valley Parkway have a sufficiency rating of below 80. It appears that all Sun Valley structures sufficiency ratings have now stabilized and for the most part will show no or slight (acceptable) decreases in yearly sufficiency rating. We will continue to monitor the Sun Valley structures.

Potential Federal Fund Projects vs. Overall MCDOT Inventory:

In 2001 the percentage of bridges and/or structures eligible for federal funds was 19.7%. In 2002 the percentage increased to 29.5%. Again, this increase is attributable to the number of structures along the Sun Valley Parkway. Without these structures the percentage of bridges and/or structures eligible for federal funds would have been 5.7%. This continues to suggest that based on the current inspection data, the vast majority of bridges and/or structures in Maricopa County are still in excellent condition.

NOTABLE 2002 BRIDGE EVENTS

In fiscal year 2002, during a routine bridge inspection, the MC85 Bridge at the Agua Fria River was found to be structurally deficient. This bridge has been in service for traffic during January and February of 2002 until temporary supports could be secured thus allowing it to be reopened to the public. While this "temporary fix" provides a safe bridge, it is imperative a permanent solution is found and repairs begin very soon. In Fiscal 2004 this bridge is scheduled for scour protection. The temporary supports may interfere with the scour protection; therefore a permanent fix must be completed prior to scour protection. Another notable event will be the repair of the bearing devices on the Gillespie Dam Bridge. Again, routine inspection revealed that the bearing rollers are out of alignment, therefore temperature variations induce stresses of unknown magnitude in the top and bottom chords of the bridge. The Gillespie Dam Bridge is MCDOT's only bridge currently listed in the National Register of Historic Places.

Notable Sufficiency Rating Changes to MCDOT's Bridges and Structures

There were 32 notable sufficiency-rating changes (declines > than 5 points or increases < than 5 points) in individual facilities since their last review. Twenty of the facilities were along the Sun Valley Parkway and was attributable to erroneous data in the inventory. The structures without sufficiency rates have missing information or are new structures in the inventory and will be corrected during the next inspection cycle.

Status of the Structures along the Sun Valley Parkway

MCDOT will continue to monitor the structures along the Sun Valley Parkway. In 2002, of the 87 structures, 46 experienced no sufficiency rate change, 21 experienced moderate sufficiency rate change (deterioration of -2.01 to -4.09 points), 3 experienced significant sufficiency rate change (deterioration of -8.68 to -10.64 points), and 17 experienced an extensive sufficiency rate change (deterioration of -18.41 points).

SYNOPSIS OF MCDOT'S BRIDGE PROJECTS

Bridge Projects in the MCDOT FY 2003-2007 TIP

Currently MCDOT has eight bridge and structure projects in the current TIP. These projects include scour protection, replacement, new design and minor modification. Refer to Table 9 for a list of the projects.

The Federal Highway Administration guidelines stipulate that when a bridge's sufficiency rating falls below a score of 50, the bridge becomes eligible for federal replacement funds. In 2002 the sufficiency rating for the Gillespie Dam Bridge rose from a 48.80 to a 51.40. Therefore for the next year this structure is removed from the eligible list for Federal Replacement Funds. There were however, two other structures that received a sufficiency rating of less than 50. One structure is currently under construction and the other should go to construction in early 2003.

TABLE 9: Bridge Projects in the MCDOT FY 2003-2007 TIP

STATUS	SUFF RATE	FEATURES	FACILITY	LOCATION	IMPROVEMENT
FY 2004	36.33	Avondale Wash	MC-85	0.4 Mi E/O Estrella Parkway	Improve Drainage Underneath Roadway
FY 2003		Sanoki Wash	Chandler Heights Road	0.25 E/O Sossaman Rd	Replace Dip Crossing W/ New Bridge (design only)
FY 2006		Eastern Canal	Chandler Heights Road	0.25 Mi W/O Gilbert Rd	Replace Pipe With Box Culvert
FY 2004		Eastern Canal	Queen Creek Road	0.5 Mi E/O Gilbert Road	Replace Pipe With Box Culvert
FY 2004	98.69	Hassayampa River	Old US80 - FAS 415	500' E/O Salome Hwy	Scour Protection
FY 2005	96.84	Gila River	Tuthill Road	At the Gila River	Scour Protection
FY 2005	94.22	Salt River	Alma School Road	McLellan Road to North Bridge	Widen the South Bridge
FY 2005	83.10	Salt River	Alma School Road	300' S/O McKellips Rd	North - Grade Control Structure

Bridges & Structures Eligible for Federal Rehabilitation Funds (Sufficiency Rating Between 50 and 80)

The Federal Highway Administration guidelines stipulate that when a bridge's sufficiency rating falls between a score of 50 and 80, the bridge becomes eligible for federal rehabilitation funds. There are 108 facilities in MCDOT's inventory that have sufficiency ratings between 50 and 80. All of the 87 facilities along the Sun Valley Parkway fall between 50 and 80. Although these 87 facilities are eligible for federal rehabilitation funds, they are not presently in a condition that would warrant repair. We will continue to monitor these as well as all structures each inspection cycle. If adverse deterioration continues or increases, remedial action will be considered.

Bridge & Structure Projects Completed in FY 2002

Five bridge/structure projects (new structures or scour protections) were completed in FY 2002. Table 10 shows these completed projects.

TABLE 10: Bridge & Structure Projects Completed in FY 2002

STRUCT NUMBER	NAME	FACILITY	ORIG CONST DATE
10370	Clearview Road	at Estrella Freeway – Loop 303 (new bridge)	2002
10371	Mountain View Road	At Estrella Freeway – Loop 303 (new bridge)	2002
10368	129th Avenue	Drainage Channel N/O Camelback Rd.	2001
990224	Dysart Road	Drainage Channel N/O Camelback Rd.	2001
10277	El Mirage Road	Drainage Channel N/O Camelback Rd.	2001

Status of Bridge & Structure Projects Currently Being Designed

There are currently four bridge projects in various stages of design as well as numerous structure projects within the Anthem community currently under design as shown in Table 11.

TABLE 11: Bridge & Structure Projects Currently Being Designed

NAME	FACILITY	STATUS
Chandler Heights Rd	Sanokai Wash	In House DCR
Queen Creek Rd	Eastern Canal	In House design
Estrella Fwy – Loop 303	Agua Fria River	Design by Consultant
Power Road	4 various locations	In House design

Status of Bridge & Structure Projects Currently Under Construction

There are two bridge projects currently in various stages of construction and numerous structure projects within the Anthem community currently under construction and others completed but not yet in the current inventory. Table 12 lists these bridge projects.

TABLE 12: Bridge & Structure Projects Currently Under Construction

STRUCT #	STATUS	NAME	FACILITY	LENGTH
Pending	Under Construction	Deer Valley Road	New River	268 ft.
Pending	Under Construction	Power Road	Queen Creek Wash	193 ft.

Bridge & Structure Projects in the Current Project Pool

Currently MCDOT has 10 bridge or structure projects in the project pool. These projects are re-scored each year along with new bridge and structure projects. Top scoring projects will advance to their next respective level (i.e. CAR to DCR, DCR to Design or Construction, and Design to Construction). Table 13 lists of these projects.

TABLE 13: Bridge & Structure Projects in the Current Project Pool

STATUS	ON ROAD	AT LOCATION	BRIDGE TOTAL PTS	RPT	PROJECT DESCRIPTION	STATUS	SUPERVISOR DISTRICT
Scored / Idle	Hawes Rd	Sanokai Wash	1.787536	CAR	Replace a low water crossing with a Bridge.	CAR	District 1 – Brock
Scored / Idle	Ocotillo Rd	Eastern Canal	0.9126545	CAR	Install New Box Culvert To Accommodate The Ultimate Roadway Cross Section.	CAR	District 1 – Brock
Scored / Idle	Riggs Rd	Sanokai Wash	2.210	CAR	Replace A Low Water Crossing With A Five Lane Bridge	CAR	District 1 – Brock
Tip For Design	Gilbert Rd	Salt River	25.00	DCR	Replace Bridge And Adjacent Low Water Crossing With A 6-Lane Bridge.	Design	District 2 – Stapley & District 5 - Wilcox
Tip For Design	McKellips Rd	Salt River	8.45	DCR	Replace Low Water Crossing With A 6-Lane Bridge.	Design	District 2 – Stapley & District 5 - Wilcox
Tip For Design	Chandler Heights Rd	Eastern Canal	13.64	DCR	Install New Box Culvert To Accommodate The Ultimate Roadway Cross Section.	Design	District 1 – Brock
Tip For Design	Chandler Heights	Sanokai Wash	7.808946	CAR	Replace A Low Water Crossing With A Four-Barrel Reinforced Concrete Box Culvert.	Design	District 1 – Brock
In TIP	Queen Creek Rd	Eastern Canal	25.91		Replace Pipe Crossing With a New Box Culvert	TIP	District 1 – Brock
In TIP	Gilbert Rd	Eastern Canal	23.32	CAR	Install New Box Culvert To Accommodate The Ultimate Roadway Cross Section.	TIP	District 1 – Brock
Scored / Idle	Guadalupe Rd	Eastern Canal	8.106218	CAR	Construct a U-Shape Channel And Replace Pipe With A Box Culvert. CAR Recommends DCR Due To Complexity.	CAR	District 2 – Stapley

ROADWAY MANAGEMENT SYSTEM - EXECUTIVE SUMMARY

The Road Management System (RMS) is a tool that analyzes the physical attributes of roadways as well as the current condition of roadway pavement and ride quality. The information derived from the RMS is used to make recommendations to decision makers concerning how to best maintain and preserve county roads. The primary goal of the RMS is to ensure acceptable ride quality and safety for the traveling public in a cost efficient manner in accordance with the specifications of the MCDOT Roadway Design Manual.

Purpose of the RMS

All road surfaces deteriorate over time due to traffic and environmental conditions. MCDOT's analysis has shown that it costs the traveling public less to have good roads than bad roads but only if the roads are kept at a reasonable level of serviceability. Therefore, the County has set up a program to continuously monitor roadway conditions, report the roadway conditions to the decision makers through the RMS, and attempt to maintain all of its roadways at an acceptable level. Preventative maintenance is the soundest way to reduce pavement failure.

Preventive maintenance is the treatment applied to prevent or reduce the rate of deterioration on roads and the expenditures for pavement work. Preventive maintenance is limited to such activities as surface seals and thin overlays that do little to change the structural capacity of the pavement but do add years of life to the road surface. The old colloquial saying of "pay me now, or pay me later" truly applies to road surface maintenance.

The first feature of the County's general framework for roadway management is an inventory of the pavements in the network; Second, a systematic procedure is used to evaluate the condition of these pavements and; Third, the RMS defines maintenance and rehabilitation strategies. Finally, based on the pavement condition, the RMS identifies the network maintenance and rehabilitation needs, selecting the most appropriate strategy for each pavement section. The RMS program repeats the analysis for a five-year period and projects the Pavement Condition Ratings (PCR's) over time so that long-term work plans and budgets can be prepared.

ROLES OF THE RMS IN CAPITAL IMPROVEMENTS PROGRAMMING

The RMS determines preventive maintenance, rehabilitation, and reconstruction needs over a five-year span. It also recommends strategies that maintain the overall network at a condition required by the MCDOT Roadway Design Manual and expected by the traveling public. These determinations are presented each November to the MCDOT Operations Division and Planning Division for consideration in the Transportation Improvement Program (TIP) or the internal Operations Division Work Program.

ROADWAY EVALUATION PARAMETERS

The RMS uses six different categories of information to determine which roadways in the network require attention. These categories are both independently analyzed and mathematically combined to offer a snapshot for the decision makers to annually monitor roadway conditions.

Data included in the RMS are the road inventory, the pavement conditions rating, the international roughness index, the sufficiency rating, the work history data, and the traffic volumes data. All play important roles in determining: What work needs to be done annually.

Roadway Inventory Data

Roadway Inventory information comes from the Road Information System (RIS) Platform Conversion Application (RPCA) and RMS databases. The following types of information are available in the databases for roadways owned by the County:

- Road name, and cross road references
- Segment length
- Functional classification of the roadway
- Number of lanes
- Width of lanes
- Surface type
- Shoulder width and type
- Maintenance history
- Traffic volumes
- Right-of-way width

Pavement Condition Rating (PCR)

MCDOT's Road Management Section evaluates pavement conditions by inspecting all segments of paved roads in the County. The result allows for a quantifying of the overall pavement condition in the road network. Pavement conditions are updated annually on most section line roads (Principal Arterials) and every other year on collector and some local roads. Measuring surface distress types determines the Pavement Condition Ratings (PCR) such as:

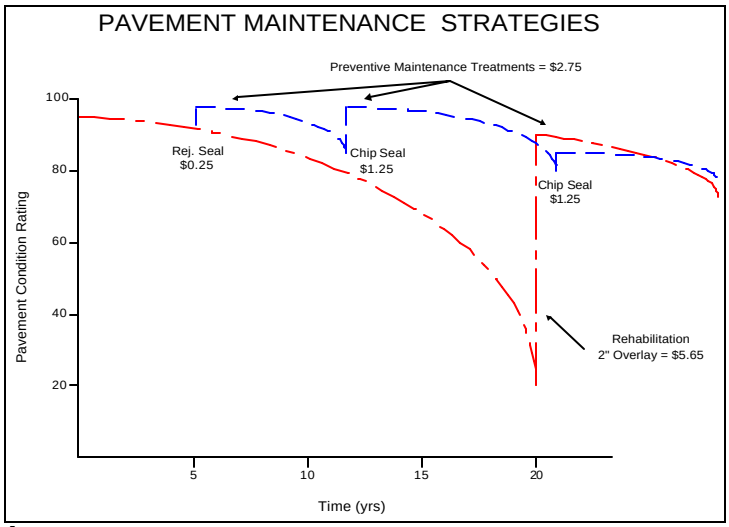
- Transverse cracking
- Longitudinal cracking
- Fatigue cracking
- Block cracking
- Rutting
- Raveling
- Shoving / Pushing / Corrugations

- Excess asphalt Patching

The above information is then combined so that each road is scored on a scale from 1 to 100 with 100 representing an excellent roadway surface.

The Maricopa County Department of Transportation relies on the PCR for looking into potential preventative maintenance strategies and long range planning. Pavement preventive maintenance treatments need to be performed before the pavement conditions get to the point of rehabilitation or reconstruction. Timely treatment strategies prove to be the most cost effective. Figure 2 shows MCDOT's preventive maintenance strategy.

Figure 3. Pavement Maintenance Strategies



Sufficiency Rating

The geometric information for each section of the road is maintained and used in this rating. This information is collected by the MCDOT Road Management Section for each roadway. The rating identifies how each roadway segment compares to the MCDOT Roadway Design Manual's standards for each road segment's functional classification. The following information is maintained in the RMS for each County roadway segment:

- Lane width
- Shoulder width
- Bottleneck features
- Drainage features
- Vertical sight distance
- Horizontal sight distance

The above information is then combined so that each roads is scored on a scale

from 1 to 100 scale with 100 representing a road in complete compliance with the RDM standards.

International Roughness Index (IRI)

International Roughness Index (IRI) is determined by a CLASS II direct profile measuring devise as classified in the Highway Performance Monitoring System (HPMS) Field Manual published by the Federal Highway Administration. IRI rating (inches per mile) is achieved by dividing the total roughness count by the distance measured and reported as a whole number.

MCDOT uses Laser Road Profiler (LRP) and a Distance Measuring Instrument (DMI) mounted in a two wheel drive vehicle. The LPR measures the vertical displacement (upwards and downwards) that a passenger would experience traveling at the posted speed limit. This is accomplished by measuring with the laser the distance between the road surface and the laser pick up every three inches (seven and half centimeters). The road roughness is measured in tenths of an inch (two and half millimeters) increments and converted through the IRI software. The DMI accumulates and records the total distance traveled. To ensure accuracy, all equipment is periodically calibrated according to ADOT's established profiles.

This information is then combined so that each roads is scored on a sliding scale from 1 to 500 scale with 500 representing an extremely rough section of a road.

Work History Data

The work history on each roadway is kept in the surface treatment RCPA database maintained by the Road Inventory Section. Records of major construction and maintenance activities performed on pavements are maintained by MCDOT and contain the following types of information:

- Type of work
- Material used, types, and thickness
- Completion date

Traffic Volume Information

The MCDOT Traffic Engineering Section conducts all traffic counts for MCDOT. Raw traffic count information is converted to Average Daily Traffic (ADT) volumes on all roadways within the network. The County conducts annual traffic counts on section line roads classified as either collectors or arterials. Local roads are counted as needed. This data is used to determine preservation strategies and traffic congestion levels throughout the County.

Current State of the System

The RMS report is in its fifth year. Annual data for the five years have been combined to show the 5-year comparison for each of the three roadway indicators. This method allows broader visibility to the progress of the County's roadway network with regards to improvements and changes throughout the 5 years.

From fiscal year 1999 to fiscal year 2003, the County roadway system has declined due to the annexation of roads from various cities throughout the County. As a whole, most of the County roadways remain in excellent or very good condition requiring only preventative maintenance throughout the year.

The Pavement Condition Ratings in Table 14 shows that 77% of the system is currently in "excellent" condition. This is an increase of nearly 7% from fiscal year 1999. Another 18% received a "very good" score, a negative difference of 6% from FY99. This positive and negative correlation indicates equilibrium in the system.

Table 14. Pavement Condition Rating

PCR	Pavement Quality	FY1999 Miles	FY 2000 Miles	FY 2001 Miles	FY 2002 Miles	FY 2003 Miles
100-85	Excellent	979.04	858.04	935.61	934.12	983.14
% of system		70.30	63.00	69.80	72.40	77.00
84-71	Very Good	333.94	388.44	288.82	283.24	227.70
% of system		24.00	28.60	21.50	22.00	18.00
70-55	Good	73.34	105.24	103.38	51.96	38.23
% of system		5.30	7.70	7.70	4.00	3.00
54-40	Fair	5.81	9.64	12.68	20.48	24.01
% of system		0.40	7.00	0.90	1.60	2.00
>40	Poor	0.11	0.00	0.00	0.15	0.50
% of system		0.00	0.00	0.00	0.00	0.00
Total		**1,392.24**	**1,361.36**	**1,340.49**	**1,289.95**	**1,273.58**

Table 15. Sufficiency Rating

Sufficiency Rating	Road Quality	FY 1999 Miles	FY 2000 Miles	FY 2001 Miles	FY 2002 Miles	FY 2003 Miles
100-85	Excellent	690.54	667.05	655.70	650.10	644.79
% of system		54.60	54.60	54.90	55.80	55.00
84-71	Very Good	443.08	424.09	416.19	401.43	402.19
% of system		35.00	34.70	34.80	34.40	35.00
70-55	Good	121.01	120.09	112.98	105.35	101.49
% of system		9.60	9.80	9.50	9.00	9.00
54-40	Fair	10.46	10.46	9.47	8.57	8.57
% of system		0.80	0.90	0.80	0.70	1.00
>40	Poor	0.00	0.00	0.00	0.00	0.00
% of system		0.00	0.00	0.00	0.00	0.00
Total		**1,265.09**	**1,221.69**	**1,194.34**	**1,165.45**	**1,157.04**

Table 16. IRI Rating

Roughness Rating	Ride Quality	FY1999 Miles	FY 2000 Miles	FY 2001 Miles	FY 2002 Miles	FY 2003 Miles
0-59	Very Smooth	67.94	66.50	90.73	91.49	69.36
% of system		5.40	5.20	7.00	7.20	6.00
60-94	Smooth	192.55	190.60	239.01	257.82	281.15
% of system		15.20	14.80	18.50	20.40	22.00
95-170	Average	734.86	730.63	668.50	653.09	653.04
% of system		58.10	56.90	51.70	51.70	52.00
170-220	Rough	219.88	241.89	239.62	214.23	197.61
% of system		17.40	18.80	18.50	17.00	16.00
>220	Very Rough	50.19	54.83	55.93	46.19	50.02
% of system		4.00	4.30	4.30	3.70	4.00
Total		**1,265.42**	**1,284.45**	**1,293.79**	**1,262.82**	**1,251.18**

The Sufficiency Rating in Table 15 follows the same pattern. There was an increase in the number of miles with an “excellent” rating and corresponding numbers to confirm it. The figures were the same or down slightly in the other columns.

Similarly, the International Roughness Index in Table 16 has improved its two top scores roughly 7% from fiscal year 1999. The increase also affected the lower ratings negatively. This correlation shows the aforementioned equality in the roadway network.

Preservation Strategies and Maintenance

The Preservation Strategy Table (table 17) confirms that providing timely preventative maintenance curtails roadway failure and reconstruction. While the total mileage in the system has decreased, the percentage of preventative or low maintenance strategies has remained stable. There is only one roadway segment needing reconstruction.

Recommended Roadway Widening

The RMS not only uses traffic volumes to recommend improvement strategies but also widening suggestions. Each roadways number of lanes and accompanying average daily traffic (ADT) affect possible expansion. Roads that have two or less lanes and currently experience more than 5,000 ADT are recommended for study. Additionally, roads that are projected to have more than 7,000 ADT within six years are also recommended. Future ADT counts are estimated by using current data compounded annually 3.5%. Table 18 shows the 47.51 miles of County roadways recommended for widening.

Table 17. Preservation Strategies

Preservation Strategy	FY 1999 Miles	FY 2000 Miles	FY 2001 Miles	FY 2002 Miles	FY 2003 Miles
Preventative Maintenance	1621.61	1768.72	1190.89	964.35	976.68
% of system	89.7	88.7	88.5	89.5	90.6
Surface Treatment	111.26	125.36	37.4	38.43	23.89
% of system	6.2	6.3	2.8	3.6	2.2
Thin Overlay	65.81	91.91	106.3	66.68	72.63
% of system	3.6	4.6	7.9	6.2	6.7
Structural Overlay	8.74	8.84	11.14	8.15	3.17
% of system	0.5	0.4	0.8	0.8	0.2
Reconstruct	0	0	0	0	0.5
% of system	0	0	0	0	0
Total	**1807.42**	**1994.83**	**1345.73**	**1077.61**	**1076.87**

Table 18. Recommended Roadway Widening Projects

Road	From	To	Total Miles	ADT	Current Lanes	Future ADT
35th Ave	Baseline Rd	Southern Ave	1.00	5,724	2	7,029.07
56th St	I 10 Fwy	Gila River Indian Reservation	0.30	10,879	2	13,359.41
67th Ave	Pinnacle Peak Rd	Happy Valley Rd	1.00	7,686	2	9438.41
83rd Ave	Peoria City Limits	Pinnacle Peak Rd	0.93	8,740	2	10,732.72
91st Ave	Camelback Rd	Northern Ave	3.00	19,810	2	24,326.68
99th Ave	Glendale City Limits	Loop 101	0.10	40,038	2	49,166.66
Alma School Rd	Mc Kellips Rd	Mcdowell Rd	0.68	6,658	2	8,176.02
Camelback Rd	El Mirage Rd	115th Ave	1.00	5,937	2	7,290.64
Carefree Hwy	7th Ave	52nd St	6.50	18,514	2	22,735.00
Cave Creek Rd	Phoenix City Limits	Cave Creek City Limits	0.90	16,719	2	20,530.93
Del Webb Blvd	Bell Rd	107th Ave	0.27	18,651	2	22,903.43
Ellsworth Rd	Empire Blvd	Germann Rd	5.00	6,640	2	8,153.00
Hayden Rd	Henshaw Rd	Mc Kellips Rd	1.00	24,651	2	30,271.43
Maricopa Rd	Queen Creek T. I.	I 10 Fwy	2.08	13,656	2	16,769.57
Mc Dowell Rd	Alma School Rd	Arizona Ave	0.77	13,536	2	16,622.21
Mc Kellips Rd	Mesa City Limits	Crismon Rd	0.51	5,513	2	6,769.96
Meridian Rd	Broadway Rd	Apache Tr	0.50	8,477	2	10,409.76
Northern Ave	115th Ave	Loop 101	2.12	9,335	2	11,463.38
Olive Ave	Reems Rd	Dysart Rd	3.00	6,309	2	7,747.00
Olive Ave	El Mirage City Limits	99th Ave	3.01	15,204	2	18,670.50
Peoria Ave	111th Ave	Peoria City Limits	2.00	9,923	2	12,185.00
Recker Rd	University Dr	Adobe Rd	0.50	10,613	2	13,032.76
Riggs Rd	I 10 Fwy	Price Rd	1.57	12,355	2	15,171.94
Rittenhouse Rd	Williams Field Rd	Recker Rd	0.95	6,216	2	7,633.25
Rittenhouse Rd	Power Rd	Ellsworth Rd	3.71	9,235	2	11,340.58
Southern Ave	35th Ave	27th Ave	1.00	5,86	2	7,228.01
Thunderbird Blvd	98th Ave	Peoria City Limits	0.49	20,844	2	25,596.43
Union Hills Dr	107th Ave	99th Ave	0.62	12,177	2	149,53.36
University Dr	Ellsworth Rd	Meridian Rd	3.00	18,633	2	22,881.32
		Total	**47.51**			